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CLAIMS

The invention claimed is:

1. A method of forming regions of differing composition over a substrate, comprising:

forming a material over a substrate and forming a pattern of at least one substantially amorphous region and at least one substantially crystalline region within the material, the material having a first composition; the at least one substantially crystalline region defining at least one first region over the substrate, and the at least one substantially amorphous region defining at least one second region over the substrate; and

selectively replacing the at least one substantially amorphous region of the material relative to the at least one substantially crystalline region of the material; the at least one substantially amorphous region of the material being selectively replaced with a second composition which is different from the first composition; after the selective replacing, the at least one first region having the first composition and the at least one second region having the second composition.

2. The method of claim 1 wherein the substrate is a semiconductor substrate.

3. The method of claim 1 wherein:

the first composition is electrically insulative; and

the second composition is electrically conductive.

4. The method of claim 3 wherein there are a plurality of first regions and wherein at least some of the first regions are islands of the electrically insulative first composition surrounded by the electrically conductive second composition and correspond to quantum anti-dots.

5. The method of claim 3 wherein there are a plurality of second regions and wherein at least some of the second regions are islands of the electrically conductive first composition surrounded by the electrically insulative second composition and correspond to quantum dots.

6. The method of claim 1 wherein:

there are a plurality of the first regions and a plurality of the second regions;

at least some of the first regions are formed as rings and at least some of the second regions are islands surrounded by the rings;

the first composition is electrically insulative; and

the second composition is electrically conductive.

7. The method of claim 6 wherein the islands of second composition within the rings correspond to quantum dot structures.

8. The method of claim 6 wherein the rings are in a closest packed configuration.

9. The method of claim 1 wherein the forming the pattern of at least one substantially amorphous region and at least one substantially crystalline region comprises exposing a portion of the material to laser-emitted light while leaving another portion not exposed to the laser-emitted light.

10. The method of claim 1 wherein the forming the pattern of at least one substantially amorphous region and at least one substantially crystalline region comprises heating portion of the material more than another portion.

11. The method of claim 1 wherein the forming the pattern of at least one substantially amorphous region and at least one substantially crystalline region comprises exposing a portion of the material to a heated structure while leaving another portion not exposed to the heated structure.

12. The method of claim 11 wherein the heated structure is an atomic force microscope tip.

13. The method of claim 11 wherein the heated structure comprises a tip shaped as a ring, and forms a plurality of the first regions as rings.

14. The method of claim 1 wherein:

the first composition consists essentially of tantalum pentoxide, tantalum nitride or aluminum oxide; and

the selective replacing comprises exposing the at least one substantially amorphous region and the at least one substantially crystalline region to a tungsten-containing compound or a titanium-containing compound.

15. The method of claim 14 wherein the first composition consists essentially of tantalum pentoxide, and wherein the selective replacing comprises exposing the at least one substantially amorphous region and the at least one substantially crystalline region to the tungsten-containing compound, and wherein the tungsten-containing compound is WF_6.

16. The method of claim 14 wherein the first composition consists essentially of tantalum pentoxide, and wherein the selective replacing comprises exposing the at least one substantially amorphous region and the at least one substantially crystalline region to the titanium-containing compound, and wherein the titanium-containing compound is $TiCl_4$.

17. The method of claim 14 wherein the first composition consists essentially of tantalum nitride, and wherein the selective replacing comprises exposing the at least one substantially amorphous region and the at least one substantially crystalline region to the tungsten-containing compound, and wherein the tungsten-containing compound is WF_6.

18. The method of claim 14 wherein the first composition consists essentially of tantalum nitride, and wherein the selective replacing comprises exposing the at least one substantially amorphous region and the at least one substantially crystalline region to the titanium-containing compound, and wherein the titanium-containing compound is $TiCl_4$.

19. The method of claim 14 wherein the first composition consists essentially of aluminum oxide, and wherein the selective replacing comprises exposing the at least one substantially amorphous region and the at least one substantially crystalline region to the titanium-containing compound, and wherein the titanium-containing compound is $TiCl_4$.

20. A method of forming regions of differing composition over a substrate, comprising:

forming a substantially amorphous form of a material over a substrate;

subjecting the amorphous form of the material to a pattern of energy to pattern the material amongst at least one region remaining in the substantially amorphous form and at least one region in a substantially crystalline form, the at least one region having the substantially crystalline form being defined as at least one first region over the substrate, and the at least one region having the substantially amorphous form being defined as at least one second region over the substrate; and

selectively replacing one of the substantially amorphous form and the substantially crystalline form relative to the other; a second composition being provided in place of the replaced form of the material; the second composition being different from the first composition in electrical conductivity.

21. The method of claim 20 wherein the subjecting the amorphous form of the material to the pattern of energy comprises rastoring a beam of the energy across the material in the pattern.

22. The method of claim 21 wherein the beam is laser-emitted light.

23. The method of claim 20 wherein the subjecting the amorphous form of the material to the pattern of energy comprises rastoring a heated tip across the material in the pattern.

24. The method of claim 20 wherein the subjecting the amorphous form of the material to the pattern of energy comprises subjecting the material to a plurality of heated tips in the pattern.

25. The method of claim 1 wherein:

the substantially amorphous form is selectively replaced relative to the substantially crystalline form;

there are a plurality of the first regions and a plurality of the second regions;

at least some of the first regions are formed as rings and at least some of the second regions are islands surrounded by the rings;

some portions of the first composition not comprised by the rings are also not contained within a ring but instead are between two or more adjacent rings; and

said some portions of the first composition are converted from the substantially amorphous form to the substantially crystalline form prior to the selective replacement of the substantially amorphous form.

26. The method of claim 25 wherein the first composition is electrically insulative and the second composition is electrically conductive.

27. The method of claim 20 wherein the first composition is electrically insulative and the second composition is electrically conductive.

28. The method of claim 20 wherein one of the first and second regions comprises islands surrounded by the other of the first and second regions, and wherein the islands are formed to be quantum dots.

29. The method of claim 20 wherein one of the first and second regions comprises islands surrounded by the other of the first and second regions, and wherein the islands are formed to be quantum anti-dots.

30. A method of forming regions of differing composition over a substrate, comprising:

forming a substantially amorphous form of a material over a substrate, the material having a first composition and being electrically insulative;

converting the substantially amorphous form to a substantially crystalline form at one or more locations of the material while leaving one or more other locations of the material in the substantially amorphous form, the one or more locations having the substantially crystalline form being defined as first regions over the substrate, and the one or more locations having the substantially amorphous form being defined as second regions over the substrate;

selectively replacing the substantially amorphous form of the material relative to the substantially crystalline form of the material; the substantially amorphous form of the material being selectively replaced with a second composition which is different from the first composition and which is electrically conductive; thus, after the selective replacing, the first regions have the first electrically insulative composition and the second regions have the second electrically conductive composition; and

replacing the first and second compositions with third and fourth compositions, respectively; the third composition being electrically conductive and the fourth composition being electrically insulative; thus, after the replacing, the first regions have electrically conductive material and the second regions have electrically insulative material.

31. The method of claim 30 wherein at least some of the electrically conductive third composition of the first regions is in the form of islands surrounded by the electrically insulative fourth composition of the second regions, and wherein at least some of the islands are quantum dots.

32. The method of claim 30 wherein the substrate is a semiconductor substrate.

33. The method of claim 30 wherein the converting the substantially amorphous form to the substantially crystalline form comprises exposing the substantially amorphous form to laser-emitted light.

34. The method of claim 30 wherein the converting the substantially amorphous form to the substantially crystalline form comprises exposing the substantially amorphous form to a heated structure.

35. The method of claim 34 wherein the heated structure is an atomic force microscope tip.

36. The method of claim 30 wherein:

the first composition consists essentially of tantalum pentoxide or aluminum oxide; and

the selective replacing comprises exposing the substantially amorphous regions and substantially crystalline regions to a tungsten-containing compound or a titanium-containing compound.

37. The method of claim 36 wherein the first composition consists essentially of tantalum pentoxide, and wherein the selective replacing comprises exposing the substantially amorphous regions and substantially crystalline regions to the tungsten-containing compound, and wherein the tungsten-containing compound is WF_6.

38. The method of claim 36 wherein the first composition consists essentially of tantalum pentoxide, and wherein the selective replacing comprises exposing the substantially amorphous regions and substantially crystalline regions to the titanium-containing compound, and wherein the titanium-containing compound is $TiCl_4$.

39. The method of claim 36 wherein the first composition consists essentially of aluminum oxide, and wherein the selective replacing comprises exposing the substantially amorphous regions and substantially crystalline regions to the titanium-containing compound, and wherein the titanium-containing compound is $TiCl_4$.

40. A circuit construction, comprising:

a substrate;

substantially crystalline electrically insulative material over the substrate;

a plurality of openings extending within the substantially crystalline electrically insulative material; and

electrically conductive material within the openings and corresponding to quantum dots.

41. The construction of claim 40 wherein the substrate is a semiconductor substrate.

42. The construction of claim 40 wherein the electrically conductive material comprises titanium.

43. The construction of claim 40 wherein the electrically conductive material comprises tungsten.

44. The construction of claim 40 wherein the substantially crystalline electrically insulative material consists essentially of Ta_2O_5.

45. The construction of claim 44 wherein the electrically conductive material comprises titanium.

46. The construction of claim 44 wherein the electrically conductive material comprises tungsten.

47. The construction of claim 40 wherein the substantially crystalline electrically insulative material consists essentially of aluminum oxide.

48. The construction of claim 47 wherein the electrically conductive material comprises titanium.